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Breeding Soundness Evaluation of Bulls

Breeding success depends on the reproductive health of both the cow and the bull. Because a bull is expected to service a number of cows, determining the potential fertility of the bull is much more important than determining the fertility of any individual cow. It is essential to evaluate bulls every year before breeding starts because the fertility of an individual animal can vary from year to year. Surprisingly, only about 28 per cent of bulls in Alberta are evaluated for reproductive fitness.

What is a breeding soundness evaluation?

A Breeding Soundness Evaluation (BSE) predicts the potential fertility of a bull. It is based on an examination that includes tests for physical soundness, testicular size, semen quality, and in some cases, libido/mating ability.

Why do BSE on all bulls?

BSE identifies bulls with poor potential breeding ability, bulls with suboptimal fertility and can be used to improve herd fertility. The advantages of BSE are often self evident. Here are a few examples.

- Large differences exist in the semen producing ability of bulls of the same age, weight and breed. BSE can identify the estimated 20 to 40 per cent of all bulls that have unacceptable fertility levels.
- The breeding record of a bull is important, but it does not guarantee performance in the upcoming breeding season. Many factors can influence the fertility of a bull both during the breeding season and during the resting period. The BSE is an effective way to identify bulls that are no longer fertile.
- Older bulls are usually the most dominant in a group and will prevent younger bulls from breeding more than a few females. Unfortunately, these dominant animals may not have the best semen or libido. A BSE can identify dominant bulls with low fertility and prevent significant economic losses that would result from large numbers of open cows or a lengthened calving season.
- Using a BSE can improve the genetics and fertility of a herd. A bull with above average testicular size (for age and breed) will generally sire female offspring that reach puberty at an earlier age. The testicular size of bulls is also strongly correlated with a high pregnancy rate of their female offspring.

Physical soundness

A bull that cannot complete a breeding is of no use. A physical examination can determine the reproductive health of an animal. The examination has an internal and external component.

- Internal – A transrectal examination is used to evaluate the health of secondary sex organs – urethra, prostate, seminal vesicles, ampullae and vas deferens. The most common abnormality is inflammation of the seminal vesicles, a condition that can result in infertility. Infections or abnormalities of the other organs are periodically encountered.
- External – Evaluation of scrotal shape is an important part of the external reproductive examination. Sperm production only occurs at a temperature slightly lower than the rest of the body. Some scrotal shapes can effect sperm production. For instance, bulls with a wedge-shaped scrotum and testicles too close to the body have trouble with temperature regulation and therefore could be subfertile. Alternatively, bulls with a pendulous scrotum could also be subfertile as large, loose testicles have a greater tendency to swing about and be damaged.

  Palpation of the testicles and epidiymis and examination of the sheath and penis are done to detect abnormalities that could affect breeding performance.

A general health examination is the last component of the physical. Bulls need to have good conformation and eyesight. They must also be able to walk long distances

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as well as complete the act of breeding. Physical disabilities such as lameness, arthritis, sole abscesses and footrot can interfere with mating ability but can also affect sperm production if the bull spends a lot of time lying down. Cull any bull with a serious physical abnormality from the herd regardless of its semen quality.

Scrotal circumference

Measurement of scrotal circumference (SC) is the most controversial component of the BSE. Accuracy of the measurement is good if it is taken in the recommended way, but inconsistency in technique, poor restraint, excited bulls and a narrow chute can result in a range of results. If these factors are controlled, the SC measurement on a scrotum that contains normal testicles is very reliable.

The SC measurement is highly correlated to testicular weight which in turn is directly related to sperm producing capacity. Each gram of testicle produces 15 million sperm per day. Total sperm production for both testicles should be at least 6 billion a day. Research has shown that testicular size in bulls is an inherited trait. A producer who chooses bulls will a larger SC is selecting for reproduction over other production traits such as growth rate or frame size. Bulls with a lower SC may produce normal sperm and might perform adequately with a small group of cows, but they cannot meet the demands of moderate to heavy breeding pressure.

Scrotal circumference varies with the breed and age of a bull. The most significant testicular growth in a bull occurs from the ages of 6 to 36 months. Selection of potential herd sires is often done at 12 to 14 months and is based on scrotal circumference. Various breed associations and bull sale organizations have developed guidelines for the minimum SC of bulls at different ages. Examples they have given are presented in the following table.

Minimum recommended scrotal circumference measurements (1992)

Age (months)	Breed			
	Simmental	Angus Charolais Hereford Salers	Limosin	Blonde d'Aquitaine
yearling	33 cm	32 cm	29 cm	29 cm
2 and 3 years	36	34	31	34

Maximum testicular size usually occurs at 4 to 6 years of age. With advancing age, testicular tissue may lose some sperm producing capacity. Therefore, SC measurements are not as accurate after this time.

The Society for Theriogenology (the study of reproduction in animals) has recognized the extensive variation of SC between breeds of cattle. Recently, they established new lower limits for SC based on age groups but independent of breed. These measurements are a guideline only. A producer can adjust them for the breed.

Minimal measurement for scrotal circumference (Sept 1992)

Age	Min. measurement
less than or equal to 15 months	30 cm
16 to 18 months	31 cm
19 to 21 months	32 cm
22 to 24 months	33 cm
greater than 24 months	34 cm

Semen motility

Motility of semen samples is defined as the percentage and rate of forward movement of sperm in the sample. It is a measure of the ability of sperm to move toward the ovum after ejaculation has occurred. A bull producing semen containing sperm that do not move will have significantly reduced fertility. Abnormal shape of spermatozoa is the most common reason for reduced motility.

Sperm motility should not be used as a measure of fertility by itself because factors such as time, temperature, concentration, contamination and the method of evaluation all affect the motility score. For instance, the first sample taken from a bull that has not been used for a while may not be very motile but motility improves with successive ejaculations.

Semen morphology

Morphology is the study of form and structure of an organ or body part. In this case, semen morphology means the study of the shape of sperm in the ejaculate and is measured as the percentage of normal and abnormal sperm.

Abnormalities are classified as either primary or secondary, depending on whether the defect occurs in the testis or after the sperm leaves the testis. Reduced fertility usually occurs when the numbers of primary defects is greater than 18 to 20 per cent. Secondary defects are not generally as serious and do not affect fertility unless a large number are present.

Abnormalities are inherited or acquired through stress, infection, increased testicular temperature or other factors. Depending on the cause, large numbers of abnormal sperm in semen may be either temporary or permanent. Some bulls may need to be tested again in six to eight weeks.

Libido/Mating ability

This component of the BSE is the most difficult to measure. Libido is the sexual desire, or in other words, the eagerness of a bull to breed a cow. Mating ability is the ability to complete service. Both characteristics can be evaluated in a controlled testing situation. However, testing is rarely done unless a problem with the bull has been identified.

The most common way to evaluate mating ability is to observe a bull on pasture with a group of females. While this is not ideal, it is one way to spot inadequate performers. Up to 10 per cent of bulls are culled due to inadequate libido.

Who can do a BSE?

Your veterinary practitioners can evaluate bulls for potential fertility. A BSE is a relatively small investment compared to the potential dollar loss that could occur if subfertile bulls are chosen as herd sires.

How to use the BSE form

A consistent method of evaluating bulls is important. The Society for Theriogenology provides guidelines and forms, which most veterinarians use.

The 1992 revision of the Society for Theriogenology bull evaluation form classifies bulls as "satisfactory", "unsatisfactory" or "classification deferred" depending on evaluation results. Bulls do not receive a numerical grade, but they must meet minimum standards for all three categories - scrotal circumference, sperm motility and sperm morphology. "Classification deferred" is given to a bull that is not quite satisfactory but has the potential to improve. These bulls should be retested later. The grading system is designed to detect poor potential sires so they may be culled from the herd and allow the opportunity for genetic improvement.

Prepared by:
Cornelia Kreplin
Animal Health Laboratories Branch

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